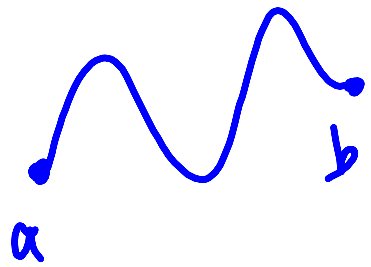
5/4/18 "Some people ask 'Why?', I ask 'Why not?'." -Anonymous

HW: Test 2 on Wednesday 5/23

AIM: How do we find the length of curves?

$$\circledast \quad \text{Length} = \int_a^b \sqrt{1 + (f'(x))^2}\, dx$$



Find the length of each function on the domain given.

1. $f(x) = x^{3/2}$ on $[0, 1]$ $\rightarrow f'(x) = \frac{3}{2}x^{1/2}$
2. $f(x) = 2(x-1)^{3/2}$ on $[1, 5]$ $\rightarrow f'(x) = 3(x-1)^{\frac{1}{2}}$
3. $f(x) = \dfrac{x^3}{6} + \dfrac{1}{2x}$ on $[1, 3]$ $\rightarrow f'(x) = \frac{1}{2}x^2 - \frac{1}{2}x^{-2}$
4. $f(x) = \ln(\cos x)$ on $\left[0, \dfrac{\pi}{4}\right]$

1) $f(x) = x^{3/2}$

$f'(x) = \frac{3}{2}x^{\frac{1}{2}}$

$$\text{Length} = \int_0^1 \sqrt{1 + \left(\tfrac{3}{2}x^{1/2}\right)^2}\, dx$$

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$\int_0^1 \left(\sqrt{1+\left(\frac{3}{2}X^{\frac{1}{2}}\right)^2}\right)dX$

1.439709873

$\int_0^1 \left(\sqrt{1+(Y_2)^2}\right)dX$

1.439709275

Answers:

1) 1.440 2) 16.597 3) 4.667 4) 0.881

ex: The length of the curve $y = x^3$ from $x = 0$ to $x = 2$ is given by

(A) $\int_0^2 \sqrt{1 + x^6}\, dx$ (B) $\int_0^2 \sqrt{1 + 3x^2}\, dx$ (C) $\pi \int_0^2 \sqrt{1 + 9x^4}\, dx$

(D) $2\pi \int_0^2 \sqrt{1 + 9x^4}\, dx$ (E) $\int_0^2 \sqrt{1 + 9x^4}\, dx$

$$\int_0^2 \sqrt{1 + (3x^2)^2}\, dx$$

Answer: E

Which of the following gives the best approximation of the length of the arc of $y = \cos(2x)$ from $x = 0$ to $x = \dfrac{\pi}{4}$?

(A) 0.785 (B) 0.955 (C) 1.0 (D) 1.318 (E) 1.977

Answer: D